

Text Readability Metric Validated for Transparent Text

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A text readability metric developed at Ames was applied to predict the readability of text superimposed on the background in a transparent manner. Both in the cockpit and in the control tower, text readability is an important issue. For many advanced displays, text will be presented on top of complex imagery, such as synthetic scene images or weather maps. In such applications, the text is either additively transparent (e.g., a head-up display that adds light to the external scene), or multiplicatively transparent (e.g., a see-through liquid crystal display that attenuates the light coming through the display). Previous tests of this metric have been restricted to text that overwrote the background

Text readability was measured for the two types of transparent text (Additive and Multiplicative) at two contrast levels (Low-0.3 and High-0.45) on three background textures (arbitrarily labeled Plain, Wave, and Culture). Five additional contrast levels (0.1, 0.15, 0.2, 0.25, 0.3) were measured for the plain backgrounds. Figure 1 illustrates the observer's task in the validation test. The observer reads a paragraph containing a word (circle, square, or triangle) inserted at random in the text, pressing a button of the corresponding shape when the word is found. The average search time is considered to be indicative of text readability. Figure 2 shows the average search times for the different conditions as a function of the text readability metric scores. The readability metric was found to account well for the difference between the Multiplicative and the Additive conditions; lower effective contrast values were assigned to the Additive conditions. The High Contrast/Culture Texture condition fell along the Plain Texture curve. The Low Contrast/Culture Texture condition appeared to be an extension of that curve, but the metric predicted more masking for the Wave Texture condition than actually produced. The overall rank correlation of the fit is -0.94, where -1 would be a perfect correlation. Although the predictions of the text readability index were not perfect, it is easy to compute (it depends only on means and variances of pixel luminances) and allows designers to estimate quickly the likely impact of changes in text contrast, mode of presentation, and background imagery on text readability.